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Magnetic nanoflowers (NFs) [1,2] are densely packed clusters of small iron oxide cores (Fig.1). Exposed to alternating magnetic fields the emitted heat of such NF ensembles is usually high compared to conventional nanoparticles, which makes them great candidates for magnetic hyperthermia application [1]. In the current study a typical NF sample (Fig. 1) was characterized by a multitude of different techniques to reveal the interrelations between structure, magnetic properties and hyperthermia performance.

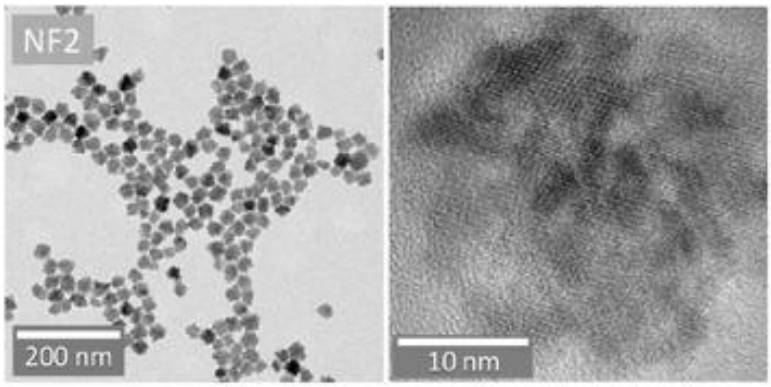

Figure 1: TEM images of the analyzed sample (NF2 from [2]).

According to hyperthermia measurements the intrinsic loss power (ILP) of the NFs amounts to 7 nHm^2/kg_{Fe}, which is high compared to literature, where typical values can be found to be in the range 0.2-4.4 nHm^2/kg_{Fe} [3]. We characterized the NFs using amongst others optomagnetic measurements [4] and quasistatic as well as dynamic magnetometry. Additionally we applied polarized small-angle neutron scattering (longitudinal neutron spin analysis POLARIS [5]). POLARIS can be only performed at a few selected large scale facilities worldwide and we conducted our experiment [6] at the Institut Laue-Langevin (ILL, Grenoble, France). Using a simple numerical inversion method [7] for the analysis of the POLARIS, optomagnetic and magnetization data, enabled a detailed, (quasi) model-free examination of the NF properties and ultimately helped us to answer why they exhibit such a high ILP.

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